ISSN 0704-3716

Canadian Translation of Fisheries and Aquatic Sciences

No. 5269

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Original title: Fiskodlingarna fororenar Skargardshavet

In: Finlands natur 43(4): 21-23, 1984

Original language: Swedish

Available from:
Canada Institute for Scientific and Technical Information
National Research Council
Ottawa, Ontario, Canada K1A 0S2

1986

9 typescript pages

Secretary of State / Secrétariat d'État

90-02739/

MULTILINGUAL SERVICES DIVISION – DIVISION DES SERVICES MULTILINGUES

TRANSLATION BUREAU **BUREAU DES TRADUCTIONS**

Client's No.–N° du client	Department – Ministère	Division/Branch – Division/Direction	City – Ville
2909914	DFO	IPB	Ottawa
Bureau No.–N° du bureau	**Language – Langue**	**Translator (Initials) – Traducteur (Initiales)**	
	Swedish-English	K.C.	

SEC 5-25 (Rev. 82/11)

Canada

FISH FARMS POLLUTING THE ARCHIPELAGIC SEA

Jan Eklund

Is fish farming in the process of bursting all limits within reason? Increasing numbers of larger plants overfertilize the waters, reduce the enjoyment of the archipelago, impair traditional fishing and compete, in addition, with other fish products. Jan Eklund in the Turku fishing district reminds us that the key to healthier fish farming lies very much in the hands of the consumers. Do you choose trout instead of Baltic herring?

Caption 1: The rainbow trout has become our most important fish species in economic terms. This new domestic animal is raised during one or two summers and weighs, at this time, approximately one kg. 2 kg dry feed or 6 kg fish are needed to produce such a trout.

The farming of rainbow trout started in Finland in the nineteen-sixties. In the beginning, the fish was farmed in earth ponds in the interior. This method was limited, however, by the lack of suitable locations for the farms and by the tendency of the water courses to become polluted.

The first farm in the sea, which started its activities in the beginning of the nineteen seventies, was located in Kustavi in the Archipelagic Sea. The farming of rainbow trout in the sea is done by means of floating net cages. In this way, the breeding is not limited by a lack of suitable farming locations. The farming made rapid progress following the initial endeavours.

In 1982, 6 325 tons of rainbow trout were produced. The total fish haul in Finland for the same year reached approximately 130 000 tons. Baltic herring constituted the largest part, approximately 80 000 tons.

Rainbow trout came in fourth place, after perch and pike but before vendace, cod, roach and whitefish.

The rainbow trout is our most important fish species in economic terms and the value of production is larger than the value of any other fish. The value of production (352 million Finnish marks in 1982) corresponds to over 40% of the total value of professional fishing.

In 1982, 293 fish farming plants existed in Finland. The lake plants (195 plants) produced 3 099 tons and the marine plants (98 plants) 3 226 tons. Marine farming is on the increase, while farming in the lakes is declining. The marine farming plants are mainly located in the Archipelag Sea, with a concentration in Kustavi, Houtskari, Rymättylä and Dragsfjärd. The plants in Turku water district produced, in 1982, approximately one third of the production of the entire country.

Loopholes in the law

When fish farming started, it remained outside the law and the supervision of the environment. The Water Act prohibits changes to and destruction of the watercourses. The decree of 1962 which concerns preventive protection measures does not include fish farming.

Control of the effects that the plants have on the watercourse has been minimal, and it is consequently difficult to evaluate the size

of the damages. In 1983, 70 fish farming plants existed in the Turku water district. 30 of these had sent advance notification (usually only subsequent to the event) to the water district and 26 had applied for permission from the water court. Only two plants had valid licenses.

Fish farming also remained outside fishery politics. It developed to its present extent on profitability and market conditions, before the fishery authorities even had time to calculate the size and the type of fish farming that Finland needed.

Large discharges

In the sea, rainbow trout is farmed almost exclusively in net cages. The basin, built of a dense net, is anchored in a sound or in some other location with flowing water. Fish fry come to the plant in the spring when one year old, and are then allowed to grow for one or two summers. The fish weigh 1-1.5 kg after the second summer.

The trout is fed dry feed or Baltic herring. The dry feed contains mainly fishmeal and oil, wheat and soy. Baltic herring is, in contrast to the dry feed, a native product which is given to the fish in small pieces or ground together with the dry feed.

Fish farms have a loading effect on the waters. The excrements of the fish and the surplus feed sink through the net cages to the bottom. Some nutrients are immediately dissolved in the water, others are slowly released from the sludge on the bottom. The sludge is transported with the water streams to the closest deep pocket.

The dry feed contains approximately 1% phosphorus and 7% nitrogen, the Baltic herring 0.4% phosphorus and 3% nitrogen.

2 kg dry feed or 6 kg fish are required in order to produce one kg of rainbow trout. This means that for each produced kg of fish the water is loaded with 16 g phosphorus and 100 g nitrogen (feeding with dry feed) or with 20 g phosphorus and 150 g nitrogen (feeding with Baltic herring).

Worse than the city of Turku

In Kustavi and Taivassalo there are approximately 20 fish farming plants. The fish farmers reported a total production of 800 tons of fish in 1983. On the basis of the above calculations, it is possible to estimate that 13 tons of phosphorus and 90 tons of nitrogen were deposited in the sea from the plants. The length of the farming period is six months, which means that the daily load amounts to 72 kg of phosphorus and 500 kg of nitrogen. The central sewage-treatment plant in the city of Turku deposited, at the same time, a daily amount of 44 kg of phosphorus in the sea.

The loads originating in the fish farms in Kustavi and Taivassalo correspond to the load of untreated sewage water from a densely built-up area of 25 000 persons. These loads constitute approximately 80% of the total yearly load of phosphorus. Other loading factors in Kustavi and Taivassalo are principally settlement and other scattered loading. The fish farms' share becomes considerably larger in the summer.

The loads can be reduced by decreasing the nutrient content of the feed or by improving the feed cycle. The development of feed, however, has resulted in considerably smaller nutrient discharges per produced kg of fish than was the case in the beginning of fish farming.

Another method for reducing the load is to collect the sludge. The collection has succeeded well in the earth ponds but still not particularly well in the net basins. Sea farming must still, for several years, depend on the sea to swallow the waste material.

Eutrophication - a problem

The vegetation thrives when nutrients are carried out into the sea. It makes no major difference if the nutrients originate in a pig-farm, a sewage-treatment plant in a city or a fish farming plant. An increased nutrient supply creates conditions which can be observed close to all cities:

- The production of algae increases. The colour and taste of the water is changed by plankton which floats around in the water, the shores become slimy from algae living on the bottom, and the shore vegetation thrives.
- The fauna on the bottom changes, and the oxygen conditions deteriorate.
- The fish fauna changes. The fish production also increases in quantity, but the value of the catch can decrease due to an increase in valueless fish species at the expense of the more valuable ones.
- The fishing itself becomes more difficult because the equipment gets slimy and dirty.

The majority of plants in Kustavi are situated in Ströms sound. The inhabitants on the sound have already long complained about the damaging effects of eutrophication. The phosphorus content of the water in the sound is approximately 20 micrograms/L. The corresponding value for the bay outside is 13-14 micrograms/L. The chlorophyll content of the water, which indicates the amount of plant plankton,

is sometimes twice as high in the sound as it is in the water outside.

The fauna on the bottom has changed and, along the shores of the sound, there is a more abundant supply of filamentous algae than on any other location in Kustavi.

No directly damaging effects on the fishery occur, as Ström lacks professional fishing. On the other hand, an important area for fishing with hoop nets is located in the bay north of Luonnonmaa in Naantali. The Baltic herring also spawns here. Three channels run into the bay, and in each channel there is a fish farming plant.

The herring nets in the vicinity of these plants become slimy at a considerably faster rate than in other areas of the bay. This obviously affects the haul. In the spring of 1983, the haul amounted to two tons/hoop net, compared to the normal seven to eight tons. Hauls have certainly also decreased in areas where the slime formation is less substantial.

The fishermen suspect that the fish plants scare away the Baltic herring, so that it no longer swims through the channels to its spawning grounds. Some aquarium experiments, conducted in the fall of 1983, demonstrated that a dry feed solution (approximately 0.7 g/L) can drive away Baltic herring.

The fish plants grow

Officially it had been hoped that fish farming, in the form of small family companies, would be an additional support for the population in the archipelago, beside some other industry. But this has not been the case. The plants in the Archipelagic Sea grow all the time in size.

The average size at the moment is approximately 40 tons, as compared to 15 tons five years ago. Behind the larger plants one often finds capital and financers from the outside. It is natural that the foremost task of the plant is to give profits to the persons who have placed their capital in the company.

The fish farmers stress the importance of the plants for the employment in the archipelago. Some municipalities, for instance Kustavi, have taken up a position for fish farming on the political grounds of employment and taxation. The state uses the same reasons to support fish farming just as it supports other projects in development areas. The Ministry for Trade and Industry gave in 1983 3.3 million Finnish marks in investments and starting subsidies to some fish farming plants which were to be established in the county of Turku and Pori.

These matters should be more fully clarified. It is certainly true that fish farming needs manpower, but the need is rather seasonal and mainly occurs in fall. In addition, companies within development areas pay no tax to the municipality during the first five years.

Towards a brighter future?

Fish farming is a developing industry, and new plants are being established in the marine areas.

The domestic consumption can hardly increase to any larger extent. This is demonstrated by the price of rainbow trout which, during three years, has remained around 20 Finnish marks/kg. On the other hand, export of rainbow trout to the U.S.A. and West Germany has started, and in this area there are still possibilities for an increase.

Fish farming can, contrary to expectations, suddenly meet with limitations. If some fish disease, for instance the VHS-disease from Estonia, spreads in Finland, it would quickly put an end to the fish export. The possibilities for expansion could, even without such a catastrophe, be locally limited by eutrophication of the waters or by resistance from fishermen or local inhabitants.

Fish farming competes with traditional fishing. The rainbow trout competes for the same markets as the salmon and the salmon trout, thereby squeezing out the scaly fish. If it is true that the fish farming plants drive away the Baltic herring, then the plants can locally constitute a threat against the fishing of such herring. The traditional fishing offers employment, utilizes domestic natural resour es and has no loading effects on the watercourses. Fish farming uses imported feed, has definite loading effects on the waters and offers the population of the archipelago seasonal employment.

I believe, against this background, that fish farming must not become the dominant industry in the archipelago. Fish farming is obviously needed but only as a support for other industries. The same objectives were also apparent in the proposal of a working committee on fish farming from the Ministry of agriculture and forestry, presented on October 13, 1983. The working committee concluded that fish for human consumption should be produced by small family companies.

The rainbow trout is an industrial product, exactly like the broiler chicken or the fatted pig. We ourselves must choose what we want - Baltic herring or rainbow trout.

Caption 2: Fish farming is important, especially with regard to restoration of fish populations under severe strain. But the increasingly larger farms for trout threaten traditional fishing by, among other things, squeezing out the scaly fish from the market. Markku Lassila

Reduce discharges - but how?

One of the essential environmental problems of fish farming is the discharge of fertilizing nutrient salts. Fish farms in a smaller municipality can have a loading effect on waters that is just as large as that of a medium-sized city.

A solution to the problem is in sight. Experiments are conducted in different parts of the world with various kinds of collection devices under the net cages. Attempts have been made in Sweden to collect fish excrements and sinking waste feed by means of a plastic funnel under the net cage. This funnel kept 85% of the trickling phosphorus and 55-75% of the nitrogen.

The above method can produce savings of up to one fourth of the feed costs. The sludge that is retained is three times as nutritious as cow manure and can be used as fertilizer in agriculture. It could also be used to fertilize algal plantations.